Remarks

Claims 1-11 were pending in this application. Claims 1-5 have been withdrawn, claims 6 and 11 have been amended, and claims 7-10 have been canceled. Accordingly, claims 6 and 11 are presently being examined.

Sections 1-4 of the Office Action required restriction to one of two groups of claims, that is:

Group I, claims 1-5, drawn to an apparatus for low-temperature catalytic gasification; and

Group II, claims 6-11, drawn to a method of low-temperature catalytic gasification.

Also, the Office Action requires affirmation of a provisional election to prosecute the invention of Group II, that is, claims 6-11.

Applicants hereby affirm the election to prosecute the invention of Group II, that is claims 6-11. Accordingly, applicants respectfully submit that the requirements of Sections 1-4 of the Office Action have been met.

Sections 5-14 of the Office Action rejected claims 6-11 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,213,587 to Ekström et al. ("Ekström patent") in view of U.S. Publication No. US2002/0159929 A1 to Kaneko et al. ("Kaneko publication").

According to the Office Action, each element of claims 6-11 can be found in (claims 7, 8, and 9), or would be inherent from (claims 6 and 10), the Ekström patent except for: (1) a screw feeder for fuel injection into the gasifier (claim 6); (2) steam spraying to prevent clogging (claim 9); and (3) a single metal catalyst (claim 11). However, the Office Action also states that

the Kaneko publication shows each of the missing elements from the Ekström patent and that including these elements from the Kaneko publication with the process of the Ekström patent would have been obvious to one of ordinary skill in the art.

Applicants hereinabove have amended claim 6 to include the subject matter of cancelled claims 7, 9, and 10. Support for this amendment can be found, inter alia, on page 11 in lines 29-34, from page 10, line 30 to page 11, line 2, and from page 12, line 19 to page 13, line 2 of the subject specification. Claim 11 has also been amended to remove reference numeral '(42)' to conform to amended claim 6 which does not have reference numerals.

With respect to amended claim 6, applicants respectfully submit that hydrocarbons such as biomass are conventionally gasified without catalysts at low-temperatures because the quantity of polluting sulfide powder produced is small enough to be almost disregarded. Similarly, in conventional high-temperature gasification of coal, a catalytic gasifier is not generally used for the same reason.

However, when a catalytic gasifier is used in high-temperature gasification, the sulfide powder, because of the high-temperature, separates from the catalyst and turns into a polluting gas products such as hydrogen sulfide (H_2S) or sulfur oxides (SO_x). Similarly, at high-temperature, phosphorous compounds vaporize from the material and produce polluting gas products. In such high-temperature gasification, the polluting gas products are chemically adsorbed or captured in the solid materials as permanent polluted material. However, high-temperature gasification devices are complex and use large amounts of energy.

While smaller quantities of sulfide and phosphorous materials result when sludge-oil-coal-agglomerates (SOCA) material is input

into a process of low-temperature gasification with a catalyst, the present invention, as recited in amended claim 6, provides a particular treatment ("catalyst reforming step") by which these polluting materials are chemically adsorbed by relatively inexpensive catalysts.

More specifically, the low-temperature gasification process of the present invention, as recited in amended claim 6, includes a step which reforms polluting gases by converting hydrogen sulfide (H_2S) into calcium sulfide (CaS) and phosphorus (P) into phosphorus halides ($P_\alpha H_\beta S_\gamma Halogen_\delta$) and accelerates this reformation by spraying steam onto the lower portion of a fixed adsorbent bed. While the Ekström patent may 'inherently' also create calcium sulfide and phosphorous halides as indicated in Section 13 of the Office Action, the Ekström patent fails to teach or suggest any means to accelerate the process as taught by the present invention and as recited in amended claim 6. Furthermore, while the Kaneko publication refers to 'spraying' with steam in paragraph 403 as noted in Section 12 of the Office Action, this reference specifically relates to the initial input of raw material into the gasifier and not to a "catalyst reforming step" or to "spraying steam onto the lower portion of [a] fixed adsorbent bed" for accelerating the step as recited in amended claim 6. Thus, neither the Ekström patent alone or in combination with the Kaneko publication, teach or suggest accelerating a catalyst reforming step by spraying steam onto the lower portion of a fixed absorbent bed as recited in amended claim 6.

Thus, for at least these reasons, applicants respectfully submit that amended claim 6 is not unpatentable over the Ekström patent in view of the Kaneko publication.

With respect to amended claim 11, applicants respectfully

submit that the present invention teaches, and recites in amended claim 11, a single metal catalyst which converts into ammonia (NH_3), that is, "convert[s] aromatic-nitrogen or HCN into an alkane compound or an alkene compound and NH_3" (emphasis added). Indeed, the primary role of the catalytic reformer of the present invention is to transform hydrogen cyanide (HCN) or its derivatives into ammonia (NH_3) or its derivatives. Comparatively, the role of the single metal catalyst in tar decomposition is relatively small since in the present invention, tar is also collected by way of heat exchange cooling.

In contrast, the "catalytic and absorbing material" of the Ekström patent converts from ammonia (NH_3) to other compounds, see column 4 at lines 39-42 of the Ekström patent. Therefore, while the 'catalyst' in the Ekström patent can also 'convert tar', the 'catalyst' does not convert into ammonia as taught the by present invention and as recited in amended claim 11, but rather converts from ammonia. Thus, the Ekström patent teaches away from conversion into ammonia by the 'catalyst' and thus, teaches away from the use of single metal catalyst as taught by the present invention and as recited in amended claim 11. Accordingly, one of skill in the art would not be led to combine the single metal catalyst of the Kaneko publication with the process of the Ekström patent to achieve the present invention as recited in amended claim 11.

Thus, for at least these reasons, applicants respectfully submit that amended claim 11 is not unpatentable over the Ekström patent in view of the Kaneko publication.

Since the subject matter of canceled claims 7, 9 and 10 has been incorporated into amended claim 6, the incorporated subject matter of each canceled claim is subject to all the limitations of

the subject matter of the other canceled claims and to the remainder of amended claim 6. Accordingly, applicants respectfully submit that the incorporated subject matter of cancelled claims 7, 9, and 10 is not unpatentable over the Ekström patent in view of the Kaneko publication for at least the same reasons as discussed above with respect to amended claim 6.

Since claim 8 has been cancelled, applicants respectfully submit that the rejection of claim 8 is now moot.

In view of the amendments of claims 6 and 11, the cancellation of claims 7-10, and the remarks above, applicants respectfully request that the rejection of claims 6-11 as being unpatentable under 35 U.S.C. §103(a) over the Ekström patent in view of the Kaneko publication be reconsidered and withdrawn.

In view of the amendments of claims 6 and 11, the withdrawal of claims 1-5, the cancellation of claims 7-10, and the remarks above, applicants respectfully request that the objections and rejections raised in this Office Action be reconsidered and withdrawn and earnestly solicit a notice of allowance.

If a telephone conference would be of assistance in advancing prosecution of the subject application, applicants' undersigned attorney invites the Examiner to telephone him at the number provided.

No fees are deemed necessary in connection with the filing of this Amendment. However, if any fees are required, authorization is hereby given to charge the amount of any such fees to Deposit Account No. 03-3125.

Respectfully submitted,

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